

# XM Series

## *Ultra-Precision Linear Motor Stages*



**Newport®**

Experience | Solutions

## USER'S MANUAL

Precision Motion—**Guaranteed™**

# Warranty

Newport Corporation warrants this product to be free from defects in material and workmanship for a period of 1 year from the date of shipment. If found to be defective during the warranty period, the product will either be repaired or replaced at Newport's discretion.

To exercise this warranty, write or call your local Newport representative, or contact Newport headquarters in Irvine, California. You will be given prompt assistance and return instructions. Send the instrument, transportation prepaid, to the indicated service facility. Repairs will be made and the instrument returned, transportation prepaid. Repaired products are warranted for the balance of the original warranty period, or at least 90 days.

## Limitation of Warranty

This warranty does not apply to defects resulting from modification or misuse of any product or part.

## CAUTION

### Warranty does not apply to damages resulting from:

- **Incorrect usage:**
  - Load on the stage greater than maximum specified load.
  - Carriage speed higher than specified speed.
  - Improper grounding.
    - Connectors must be properly secured.
    - When the load on the stage represents an electrical risk, it must be connected to ground.
  - Excessive or improper cantilever loads.
- **Modification of the stage or any part thereof.**



### CAUTION

Please return equipment in the original (or equivalent) packing.

You will be responsible for damage incurred from inadequate packaging if the original packaging is not used.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular use. Newport Corporation shall not be liable for any indirect, special, or consequential damages.

No part of this manual may be reproduced or copied without the prior written approval of Newport Corporation.

This manual has been provided for information only and product specifications are subject to change without notice. Any changes will be reflected in future printings.

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# EC Declaration of Conformity

## XM Series



### EC Declaration of Conformity

following Annex II-1A  
of Directive 2006/42/EC on machinery

**The manufacturer:**

MICRO-CONTROLE Spectra-Physics,  
9 rue du Bois Sauvage  
F-91055 Evry FRANCE

**Hereby declares that the machinery:**

- Description: " XM "
- Function: Ultra Precision Linear Motor Stage
- Models: XML210, XML350, XMS50, XMS100, XMS160

– the technical file of which was compiled by:

Mr Dominique DEVIDAL, Quality Director,  
MICRO-CONTROLE Spectra-Physics, Zone Industrielle - B.P.29  
F-45340 Beaune La Rolande France

– complies with all the relevant provisions of the Directive 2006/42/EC on machinery.  
– complies with all the relevant provisions of the Directive 2014/30/EU relating to electromagnetic compatibility.

– was designed and built in accordance with the following harmonised standards:

- NF EN 61326-1:2013 « Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements »
- NF EN 55011:2010/A1:2011 Class A

– was designed and built in accordance with the following other standards:

- NF EN 61000-4-2
- NF EN 61000-4-3
- NF EN 61000-4-4
- NF EN 61000-4-6
- NF EN 61000-4-8

### ORIGINAL DECLARATION

Done in Beaune La Rolande on 26 June 2015  
Dominique DEVIDAL  
Quality Director



DC1-EN rev:A

# Definitions and Symbols

The following terms and symbols are used in this documentation and also appear on the product where safety-related issues occur.

## General Warning or Caution



The exclamation symbol may appear in warning and caution tables in this document. This symbol designates an area where personal injury or damage to the equipment is possible.

The following are definitions of the Warnings, Cautions and Notes that may be used in this manual to call attention to important information regarding personal safety, safety and preservation of the equipment, or important tips.



### WARNING

**Warning indicates a potentially dangerous situation which can result in bodily harm or death.**



### CAUTION

**Caution indicates a potentially hazardous situation which can result in damage to product or equipment.**

### NOTE

**Note indicates additional information that must be considered by the user or operator.**

## European Union CE Mark



The presence of the CE Mark on Newport Corporation equipment means that it has been designed, tested and certified as complying with all applicable European Union (CE) regulations and recommendations.

## Warnings and Cautions



### ATTENTION

**This stage is a Class A device. In a residential environment, this device can cause electromagnetic interference. In this case, suitable measures must be taken by the user.**

# Warnings



## WARNING

The motion of objects of all types carries potential risks for operators. Ensure the protection of operators by prohibiting access to the dangerous area and by informing the personnel of the potential risks involved.



## WARNING

The magnetic channel included in this device has the potential to disrupt pacemakers. Consequently, it is recommended that individuals maintain a distance of 1 meter or more from the stage as a precautionary measure.



## WARNING

Do not use this stage when its motor is emitting smoke or is unusually hot to the touch or is emitting any unusual odor or noise or is in any other abnormal state.

Stop using the stage immediately, switch off the motor power and then disconnect the electronics power supply.

After checking that smoke is no longer being emitted contact your Newport service facility and request repairs. Never attempt to repair the stage yourself as this can be dangerous.

## WARNING

Make sure that this stage is not exposed to moisture and that liquid does not get into the stage.

Nevertheless, if any liquid has entered the stage, switch off the motor power and then disconnect the electronics from power supply.

Contact your Newport service facility and request repairs.

## WARNING

Do not insert or drop objects into this stage, this may cause an electric shock, or lock the drive.

Do not use this stage if any foreign objects have entered the stage. Switch off the motor power and then disconnect the electronics power supply.

Contact your Newport service facility for repairs.

## WARNING

Do not place this stage in unstable locations such as on a wobbly table or sloping surface, where it may fall or tip over and cause injury.

If this stage has been dropped or the case has been damaged, switch off the motor power and then disconnect the electronics power supply.

Contact your Newport service facility and request repairs.

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**WARNING**

**Do not attempt to modify this stage; this may cause an electric shock or downgrade its performance.**

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**WARNING**

**Do not exceed the usable depth indicated on the mounting holes (see section “Dimensions”). Longer screws can damage the mechanics or cause a short-circuit.**

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**WARNING**

**Do not exceed speed and load limitations as specified in chapter 3.3.**

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# Cautions

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## CAUTION

**Do not place this stage in a hostile environment such as X-Rays, hard UV,... or in any vacuum environment.**

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## CAUTION

**Do not place this stage in a location affected by dust, oil fumes, steam or high humidity. This may cause an electric shock.**

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## CAUTION

**Do not leave this stage in places subject to extremely high temperatures or low temperatures. This may cause an electric shock.**

- **Operating temperature: +10 to +35 °C**
- **Storage temperature: -10 to +40 °C (in its original packaging)**

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## CAUTION

**Do not move this stage if its motor power is on.**

**Make sure that the cable to the electronics is disconnected before moving the stage. Failure to do so may damage the cable and cause an electrical shock.**

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## CAUTION

**Be careful that the stage is not bumped when it is being carried. This may cause it to malfunction.**

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## CAUTION

**When handling this stage, always unplug the equipment from the power source for safety.**

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## CAUTION

**When the carriage is in its end-of-run position, it is strongly recommended not to go beyond this point as this may damage the stage mechanism.**

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## CAUTION

**Contact your Newport service facility to request cleaning and specification control every year.**

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## CAUTION

**You may have unfortunately put your fingers on the optical scale. This can cause failures while the stage is operating. In order to obtain an optimal operation, we advise to clean this optical scale with isopropylic alcohol.**

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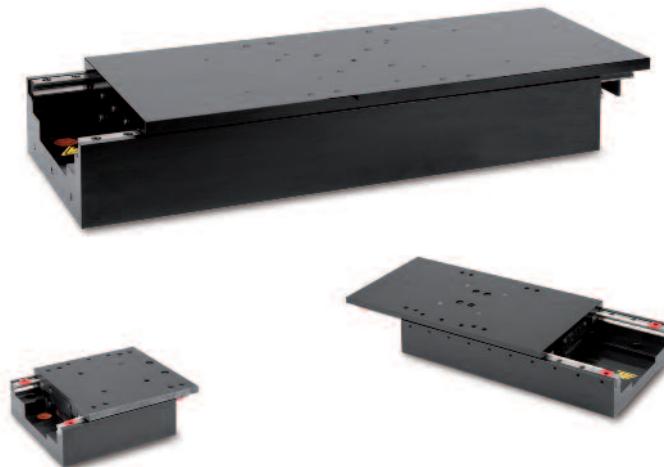


# Ultra-Precision Linear Motor Stages

## XM Series

### 1.0 Introduction

This manual provides operating instructions for the stage that you have purchased in the XM Series.



*XMS50, XMS160 and XML350 stages.*

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#### RECOMMENDATION

We recommend you read carefully the chapter “Connection to electronics” before using the XM stage.

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*A typical XYZ assembly using XML210, XMS50 and GTS30V*

## 2.0 Description

The XM series is the ultimate solution for the most demanding manufacturing and test & measurement applications. It meets ultra-precision motion requirements with high dynamics and reliability for 24/7 production environments. Typical applications include semiconductor wafer inspection, direct laser lithography, sensor test-and calibration and ultra-precision assembly.

Unlike screw driven stages, the XM stages employ a center-driven, ironless linear motor as the driving element. Since the linear motor is a frictionless direct drive device, there is no backlash or hysteresis, wind-up or stiction limiting the motion performance. The linear motor drive also offers the advantage of higher speed, acceleration and system responsiveness with no wear to motor brushes or drive screws. The extra-large, ironless motor coil ensures zero cogging for ultra-smooth velocity control at all speeds and provides a higher efficiency compared to alternative stage designs. This results in significant less heat dissipation which is generally the main limit for ultra-precision motion applications. To further improve thermal management and its effect on stage performance, the XM stages take also benefit of a sophisticated length decoupling of the magnetic track from the stage carriage.

XM stages are machined from stress-relieved 7075 aluminum ensuring long-term strength and stability. All critical stage surfaces undergo multiple machining processes and precision grinding under strict temperature and quality control, to further improve overall performance and accuracy. The T-shape carriage used on the XM stages provides the optimum solution for precision XY assemblies without impacting the stage preload. It also supplies a higher robustness and is more tolerant to non-ideal mounting conditions than stages with a C-shape carriage.

To ensure the most accurate trajectory control, XM stages feature high-class matched pairs of anti-creep crossed roller bearings. The lack of any re-circulating elements in the XM stages lead to outstanding ripple-free motion adequate for the most demanding scanning and inspection systems. Moreover, the geared retainers on these bearings prevent from bearing cage migration, which can occur with other linear bearings.

Precision position feedback is supplied by a high accuracy LIF 481 Heidenhain linear scale. The precision alignment and mounting of this low thermal expansion scale in the center of the stage minimizes the impact of temperature changes on stage repeatability and accuracy. The encoder signals are interpolated by Newport's XPS motion controller with sub-nm resolution and less than 10 nm noise for outstanding position sensitivity and stability. Absolute home position and limit signals are incorporated on the same scale without any further electronics or mechanics for improved reliability and accuracy. In general, all electronics are attached to the stationary base. So there are no moving cables inside the stage resulting in an extremely compact design with exceptional reliability and safety.

## 2.1 Design Details

Base material	High-strength 7075 Aluminum
Bearings	Anti-creep crossed roller bearings
Drive mechanism	3-phase synchronous ironless linear motor (without Hall effect sensors)
Motor initialization	Utilizes XPS controller patented feature that avoids large motions during initialization, without using Hall effect sensors
Motor commutation	Done by the XPS controller using encoder signals
Feedback	Heidenhain LIF 481 scale, 1 Vpp, 4 µm signal period, 32768-fold signal subdivision when used with XPS controller
Limit switches	Optical, on encoder's fiducial track
Origin	Optical, at center of travel, including mechanical zero signal
Drive type	Brushless DC Servo
Cable	5 m (included)



### NOTE

**This product complies with the RoHS directive  
(Restriction of Hazardous Substances).**

## 3.0 Characteristics

### 3.1 Definitions

Specifications of our products are established in reference to ISO 230 standard part II “Determination of accuracy and repeatability of positioning numerically controlled axes”.

This standard gives the definition of position uncertainty which depends on the 3 following parameters:

#### (Absolute) Accuracy

Difference between ideal position and real position.

#### On-Axis Accuracy

Difference between ideal position and real position after the compensation of linear errors.

Linear errors include: cosine errors, inaccuracy of screw or linear scale pitch, angular deviation at the measuring point (Abbe error) and thermal expansion effects. All Newport motion electronics can compensate for linear errors.

The relation between absolute accuracy and on-axis accuracy is as follows:

$$\text{Absolute Accuracy} = \text{On-Axis Accuracy} + \text{Correction Factor} \times \text{Travel}$$

**Repeatability**

Ability of a system to achieve a commanded position over many attempts.

**Reversal Value (Hysteresis)**

Difference between actual position values obtained for a given target position when approached from opposite directions.

**Minimum Incremental Motion (MIM or Sensitivity)**

The smallest increment of motion a device is capable of delivering consistently and reliably.

**Resolution**

The smallest increment that a motion device can theoretically move and/or detect. Resolution is not achievable, whereas MIM, is the real output of a motion system.

**Yaw, Pitch**

Rotation of carriage around the Z axis (Yaw) or Y axis (Pitch), when it moves.

The testing of on-axis accuracy, repeatability, and reversal error are made systematically with test equipment in an air-conditioned room ( $20^{\pm 1} \text{ }^{\circ}\text{C}$ ).

A linear cycle with 21 data points on the travel and 4 cycles in each direction gives a total of 164 points.

**Guaranteed Specifications**

Guaranteed maximum performance values are verified per Newport's A167 metrology test procedure. For more information, please consult the metrology tutorial section in the Newport catalog or at [www.newport.com](http://www.newport.com)

### 3.2 Mechanical Specifications



	XMS	XML
Travel range (mm)	50, 100, 160	210, 350
Minimum Incremental Motion, linear <sup>(4)(5)</sup> (with XPS-DRV02 Drive)	0.01	0.01
Minimum Incremental Motion, linear <sup>(4)(5)</sup> (with XPS-DRV02P Drive Module)	0.003	0.003
Minimum Incremental Motion, linear <sup>(4)(5)</sup> (with XPS-DRV02L Drive Module)	0.001	0.001
Uni-directional repeatability, guaranteed <sup>(1)(4)</sup> (µm)	0.05	0.05
Bi-directional repeatability, guaranteed <sup>(1)(4)</sup> (µm)	0.08 or $\pm 0.04$	0.08 or $\pm 0.04$
On-axis accuracy, guaranteed <sup>(1)(4)</sup> (µm)	1.5 or $\pm 0.75$	3 or $\pm 1.5$
Maximum speed <sup>(5)</sup> (mm/s)	300	300
Maximum acceleration <sup>(5)</sup> (m/s <sup>2</sup> )	5	5
Max. force (cont.) <sup>(5)</sup> (N)	16	37
Load capacity, horizontal (N)	100	300
Straightness, flatness, guaranteed <sup>(1)(2)</sup> (µm)	1.5 or $\pm 0.75$	3 or $\pm 1.5$
Pitch, guaranteed <sup>(1)(2)(4)</sup> (µrad) <sup>(3)</sup>	50 or $\pm 25$	100 or $\pm 50$
Yaw, guaranteed <sup>(1)(2)(4)</sup> (µrad) <sup>(3)</sup>	50 or $\pm 25$	100 or $\pm 50$
MTBF (h)	20,000	20,000

<sup>1)</sup> Shown are peak to peak, guaranteed specifications or  $\pm$ half the value as sometimes shown. For the definition of typical specifications which are about 2X better than the guaranteed values, visit [www.newport.com](http://www.newport.com) for the Motion Control Metrology Primer.

<sup>2)</sup> Middle 80% of travel.

<sup>3)</sup> To obtain arcsec units, divide prad value by 4.8.

<sup>4)</sup> Requires operation in a controlled environment to achieve specification.

<sup>5)</sup> Maximum value is driver dependent. Contact Newport for additional information.



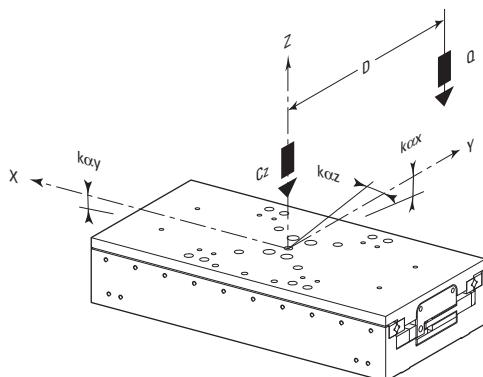
#### CAUTION

To reach specifications stated, stages must be fixed on a plane surface with a flatness of 5 µm.

### 3.3 Load Characteristics and Stiffness

#### Normal Load Capacity (Cz)

Maximum load a stage can move while maintaining specifications.



	XMS50	XMS100	XMS160	XML210	XML350
Cz, Normal centered load capacity (N)	100	100	100	300	300
kax, Compliance in roll (µrad/Nm)	3.5	2.0	1.5	0.5	0.1
kay, Compliance in pitch (µrad/Nm)	3.5	2.0	1.5	0.5	0.1
kazz, Compliance in yaw (µrad/Nm)	3.5	2.0	1.5	0.5	0.1
a, Construction parameter (mm)	109	109	109	155	155
Q, Off-center load where D = Cantilever distance in mm	$Q \leq Cz \div (1 + D/a)$				

### 3.4 Stage Weights

Weights indicated into the below table are average values for stages with a typical drive unit installed.

Stage	Mass [lb (kg)]	
	Stage	Carriage Mcar
<b>XMS50</b>	5.5 (2.5)	2.6 (1.2)
<b>XMS100</b>	7.7 (3.5)	4.0 (1.8)
<b>XMS160</b>	9.9 (4.5)	5.1 (2.3)
<b>XML210</b>	28.7 (13.0)	16.8 (7.6)
<b>XML350</b>	48.5 (22.0)	26.0 (11.8)

### 3.5 Example of Parameters “ScalingAcceleration” & “AccelerationLimit”

This example is based on Newport XPS controller and XPS-DRV02 driver.

Two parameters have to be updated in the parameter file, according to the payload put onto the XM stage:

- The parameter "ScalingAcceleration" is used by the controller to scale the output voltage sent to the driver.  
It indicates the theoretical maximum acceleration (friction not taken in account) of the XM carriage when the maximum voltage (10 volts) is applied to the driver.
- The parameter "AccelerationLimit" indicates the theoretical maximum acceleration that the controller will be able to require from the XM carriage. It correspond to the XM peak force.

For XPS controller and XPS-DRV02 driver, these parameters can be calculated using the following formulas, where the payload must be entered in kg:

$$\text{XMS} \quad \text{ScalingAcceleration}(\text{Payload}) = 70357 \cdot \frac{[\text{mm/s}^2]}{(\text{Payload} + \text{Mcar})}$$

$$\text{XML} \quad \text{ScalingAcceleration}(\text{Payload}) = 97232 \cdot \frac{[\text{mm/s}^2]}{(\text{Payload} + \text{Mcar})}$$

#### XMS160 Examples:

$$\begin{aligned} \text{ScalingAcceleration(0)} &= 30590 \text{ mm/s}^2 \\ \text{ScalingAcceleration(10)} &= 5720 \text{ mm/s}^2 \end{aligned}$$

$$\text{AccelerationLimit}(\text{Payload}) = \frac{\text{ScalingAcceleration}(\text{Payload})}{1.1}$$

#### XMS60 Examples:

$$\begin{aligned} \text{AccelerationLimit(0)} &= 27809 \text{ mm/s}^2 \\ \text{AccelerationLimit(10)} &= 5200 \text{ mm/s}^2 \end{aligned}$$

These formulas are explained below:

#### Inputs from the system

- Motor:

- Motor force constant:

**XMS:** MotorForceConstant = 19.9 N/Amp. rms

**XML:** MotorForceConstant = 27.5 N/Amp. rms

- Motor thermal resistance:

**XMS:** MotorRth = 1.8  $\left[ \frac{\text{K}}{\text{Watt}} \right]$

**XML:** MotorRth = 1.3  $\left[ \frac{\text{K}}{\text{Watt}} \right]$

- Motor constant at 300 K:

**XMS:** MotorK = 24  $\left[ \frac{\text{Newton}^2}{\text{Watt}} \right]$

**XML:** MotorK = 97  $\left[ \frac{\text{Newton}^2}{\text{Watt}} \right]$

- Driver:

XPS-DRV02 driver is using sine/cosine commutation on its input. Its maximum current of 5 A is obtained for a 10 V input, so:

MaxDriverCurrent = 5 Amp.

TranslImpedanceDriver = 0.5 Amp./V

- Mechanics:
  - XM carriage mass: See chapter: "Stage Weights" below.
- System:
 

XM rms force is defined to keep motor heating below 20 °C:

$$\text{XM\_RmsForce} = \sqrt{\frac{20 \cdot [K] \cdot \text{MotorK}}{\text{MotorRth}}}$$

**XMS\_RmsForce** = 16 Newtons

**XML\_RmsForce** = 37 Newtons

XM peak force is defined to allow two time the rms force. This value is lower than the theoretical peak force of the motor:

**XMS\_PeakForce** = 32 Newtons

**XML\_PeakForce** = 74 Newtons

The rms current limitation of the driver is set according to XM rms force:

$$\text{DriverMaximumRMSCurrent} = \frac{\text{XM\_RmsForce}}{\text{MotorForceConstant}} \sqrt{2} \left[ \frac{\text{Amp.}}{\text{Amp. rms}} \right]$$

**XMS\_DriverMaximumRMSCurrent** = 1.14 Amp.

**XML\_DriverMaximumRMSCurrent** = 1.90 Amp.

The peak current limitation of the driver is set according to XM peak force:

$$\text{DriverMaximumPeakCurrent} = \min \left( \frac{\text{XM\_PeakForce}}{\text{MotorForceConstant}} \sqrt{2} \left[ \frac{\text{Amp.}}{\text{Amp. rms}} \right] \cdot 1.1; \text{MaxDriverCurrent} \right)$$

**XMS\_DriverMaximumPeakCurrent** = 2.5 Amp.

**XML\_DriverMaximumPeakCurrent** = 4.2 Amp.

The integration time of the driver  $I^2t$  limitation is set to allow to apply the peak current for 4 seconds. This is obtained with an integration time of 15 s, which is lower than the motor thermal time constant.

**DriverRMSIntegrationTime** = 15 s

### Example for a XML210 stage with a 3 kg load

#### Inputs from the user

- Load on the carriage: Load = 3 kg

#### Calculation

- **MovingMass:**

MovingMass = Mcar + Load

- **ScalingAcceleration:**

$$\text{ScalingAcceleration} = \frac{\text{MotorForceConstant} \cdot 10 \text{ [Volts]} \cdot \text{TranslImpedanceDriver}}{\sqrt{2} \left[ \frac{\text{Amp.}}{\text{Amp. rms}} \right] \cdot (\text{Mcar} + \text{Load})}$$

ScalingAcceleration = **9172 mm/s<sup>2</sup>**

- **LimitAcceleration:**

$$\text{LimitAcceleration} = \text{ScalingAcceleration} \cdot \frac{\text{DriverMaximumPeakCurrent}}{\text{MaxDriverCurrent}} \cdot \frac{1}{1.1}$$

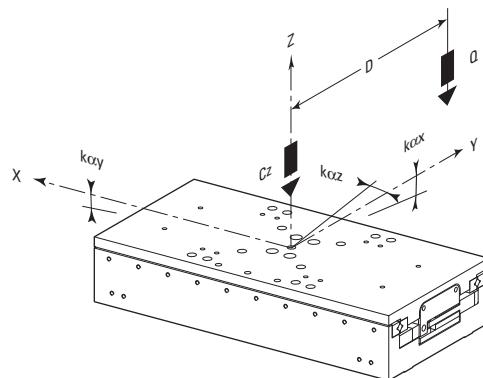
LimitAcceleration = **27856 mm/s<sup>2</sup>**

### 3.6 Estimated Moving Mass for XM Series Stages

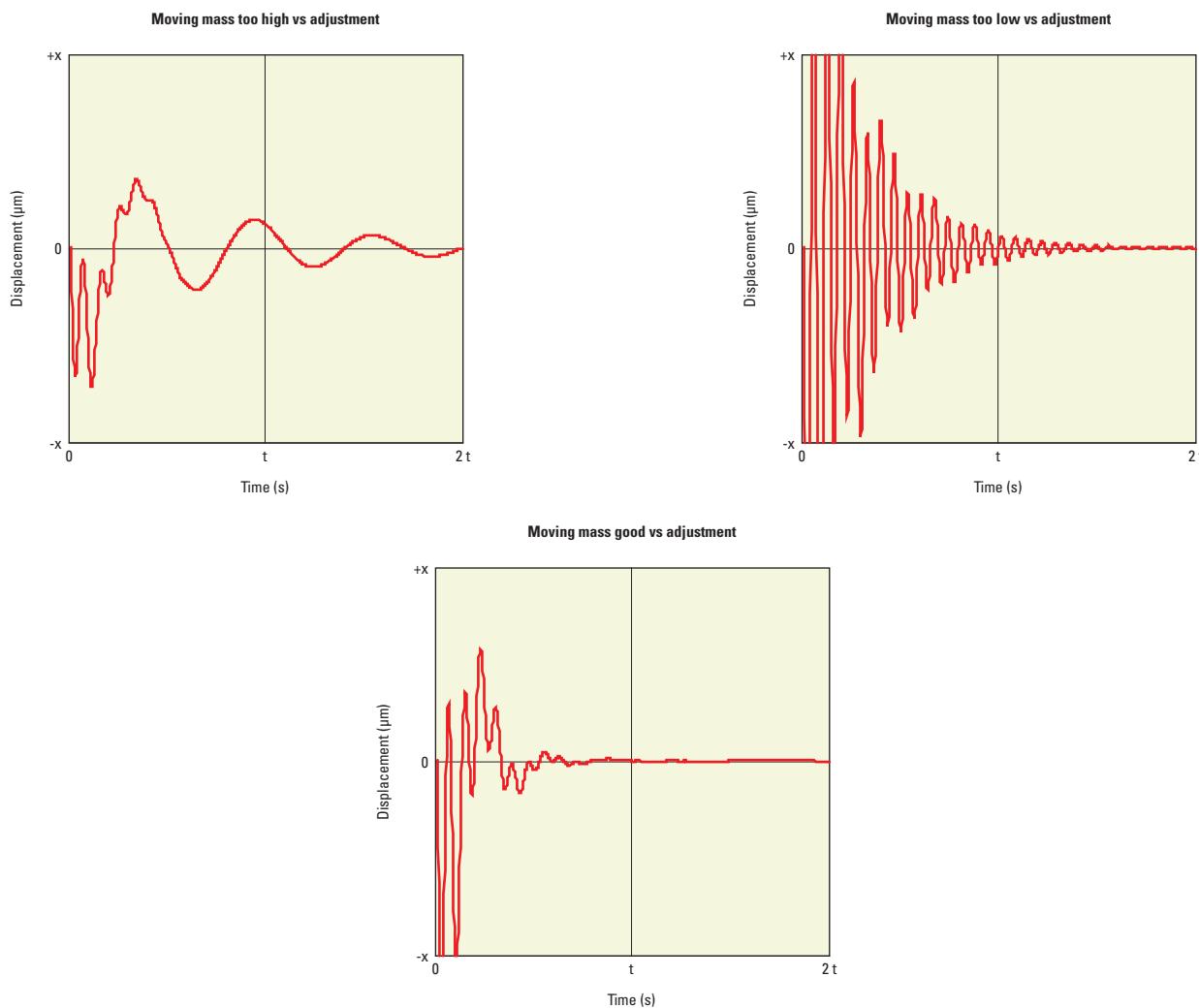
#### CAUTION



Stages with linear motor such as those of the XM series, are sensitive to the load variation and its stiffness. The typical example below shows the behavior of the displacement in accordance with the underestimated/overestimated moving mass.



Driving in force requires a good adjustment of the controller/driver theoretical acceleration parameter (ScalingAcceleration) which depends on the moving mass.

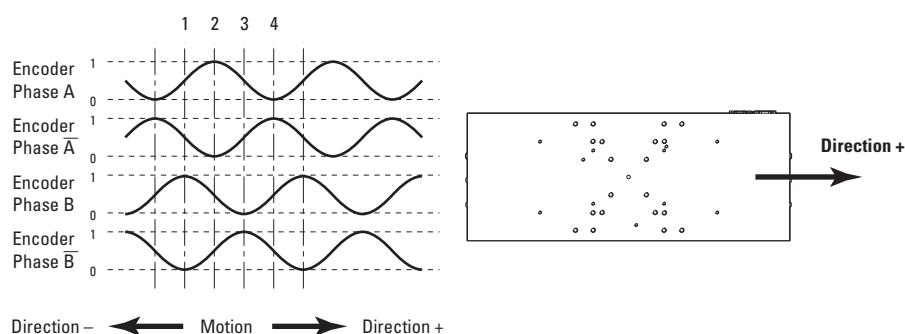


## 4.0 Drive

### 4.1 Brushless Motors Characteristics

Motor	Stage	Motor Constant (N <sup>2</sup> /W)	Magnet Pitch (mm)	Nominal Voltage (V)	Max. RMS Current (A)	Max. Peak Current (A)	Resistance per Phase (Ω)	Inductance per Phase (mH)
UM3S	XM-S	24	30	48	1.1	2.5	5.5	1.6
UL3S	XM-L	97	42	48	1.9	4.2	2.6	2

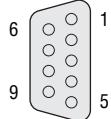
### 4.2 Feedback Signal Position



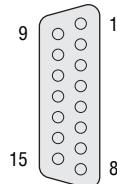
### 4.3 Pinouts

Sub-D connections for XM series stages are given in the following tables:

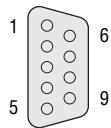
#### Motor (SUB-D9M Connector)



<b>1</b>	U Motor
<b>2</b>	U Motor
<b>3</b>	V Motor
<b>4</b>	V Motor
<b>5</b>	N.C.
<b>6</b>	W Motor
<b>7</b>	W Motor
<b>8</b>	Shield Ground
<b>9</b>	N.C.

**Encoder (SUB-D15M Connector)**

<b>1</b>	Encoder Phase B
<b>2</b>	Shield Ground
<b>3</b>	Encoder Phase A
<b>4</b>	Encoder Power: +5 V
<b>5</b>	N.C.
<b>6</b>	Limit
<b>7</b>	Index Pulse /I
<b>8</b>	Home
<b>9</b>	Encoder Phase /B
<b>10</b>	N.C.
<b>11</b>	Encoder Phase /A
<b>12</b>	N.C.
<b>13</b>	N.C.
<b>14</b>	Index Pulse I
<b>15</b>	N.C.

**Thermistance (SUB-D9F Connector)**

<b>1</b>	Do not connect
<b>2</b>	Do not connect
<b>3</b>	N.C.
<b>4</b>	N.C.
<b>5</b>	Do not connect
<b>6</b>	Thermistance 2
<b>7</b>	Shield Ground
<b>8</b>	Thermistance 1
<b>9</b>	Shield Ground

## 5.0 Connection to Newport Controllers

### 5.1 Warnings on Controllers

Controllers are intended for use by qualified personnel who recognize shock hazards and are familiar with safety precautions required to avoid possible injury. Read the controller user's manual carefully before operating the instrument and pay attention to all written warnings and cautions.

#### WARNING

**Disconnect the power plug under the following circumstances:**

- If the power cord or any attached cables are frayed or damaged in any way.
- If the power plug is damaged in any way.
- If the unit is exposed to rain, excessive moisture, or liquids are spilled on the unit.
- If the unit has been dropped or the case is damaged.
- If you suspect service or repair is required.
- Whenever you clean the electronics unit.

#### CAUTION

**To protect the unit from damage, be sure to:**



- Keep all air vents free of dirt and dust.
- Keep all liquids away from the unit.
- Do not expose the unit to excessive moisture (85% humidity).
- Read this manual before using the unit for the first time.

#### WARNING

**All attachment plug receptacles in the vicinity of this unit are to be of the grounding type and properly polarized.**

**Contact your electrician to check your receptacles.**

#### WARNING

**This product operates with voltages that can be lethal.**

**Pushing objects of any kind into cabinet slots or holes, or spilling any liquid on the product, may touch hazardous voltage points or short out parts.**

## 5.2 Connection

On each stage is represented a label which indicates its name and its serial number.



### WARNING

**Always turn the controller's power OFF before connecting to a stage.**

Stages may be connected to the rear panel motor connectors any time prior to power-up with the supplied cable assemblies.

### NOTE



**These stages are ESP compatible. Enhanced System Performance is Newport's exclusive technology that enables Newport ESP motion controllers to recognize the connected Newport ESP stage and upload the stage parameters. This ensures that the user can operate the motion system quickly and safely.**

## 5.3 Cables

Our stages are delivered equipped with a set of three 5-meter cables. They can be directly connected to our controllers/drivers.



### WARNING

**XM Series translation stages operate only with 5-meter max. cables.**

### WARNING

**These cables are shielded correctly. For a correct operation, make sure to lock connectors (ground continuity provided by cables).**

### WARNING

**Keep the motor cables at a safe distance from other electrical cables in your environment to avoid potential cross talk.**

## 6.0 Connection to Non-Newport Electronics

### 6.1 Connections

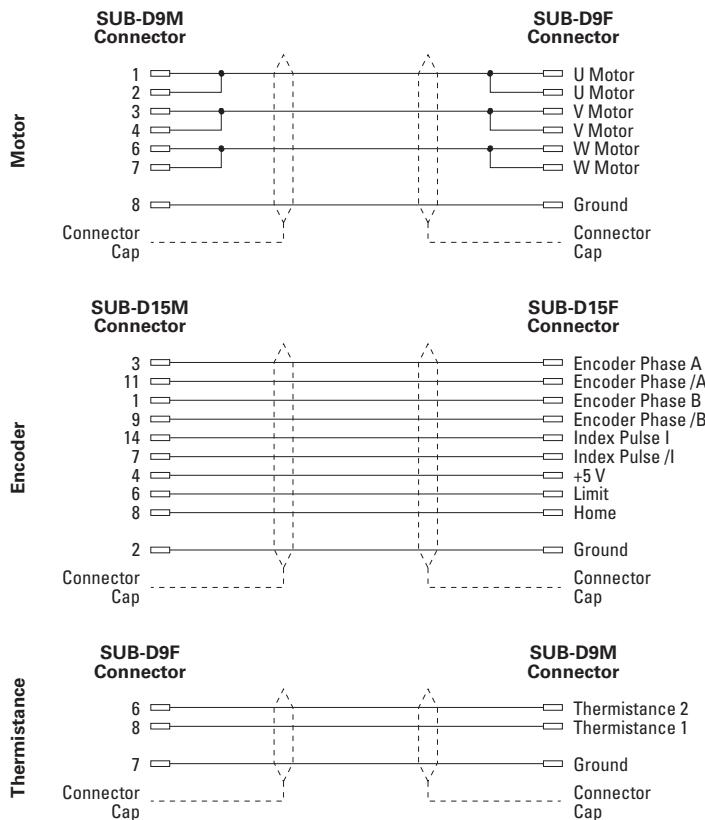
#### WARNING

Newport is not responsible for malfunction or damage to a XM stage when it is used with non-Newport controllers.

#### WARNING

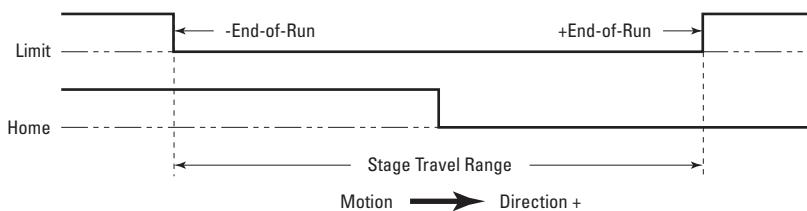
Newport guarantees “CE” compliance of the XM stages only if they are used with Newport cables and controllers.

Nevertheless, the figure below shows the wiring when a XM stage is used with non-Newport controllers.



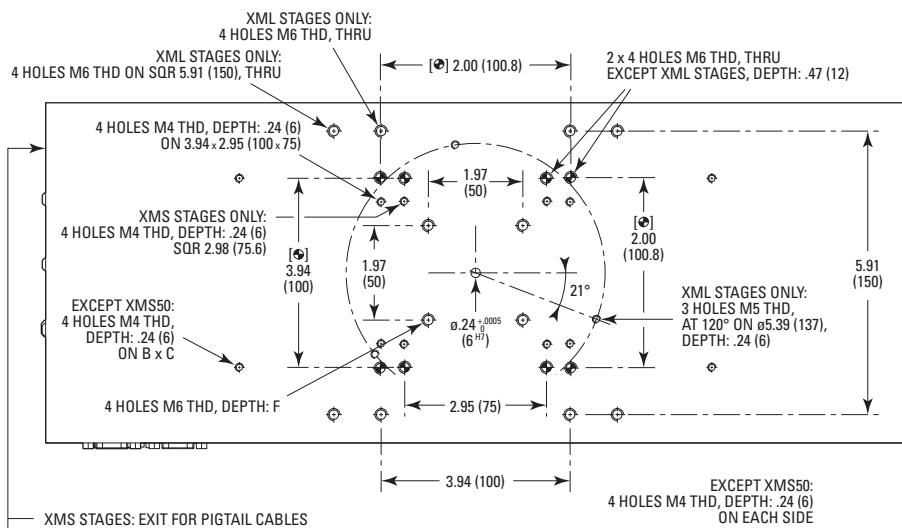
#### WARNING

+End-of-Run and -End-of-Run signals are not directly supplied by XM series stages.



They must be restored using “Limit” and “Home” signals which are generated.

## 7.0 Dimensions

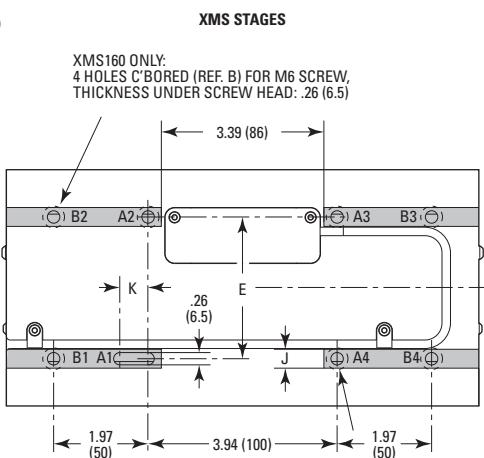
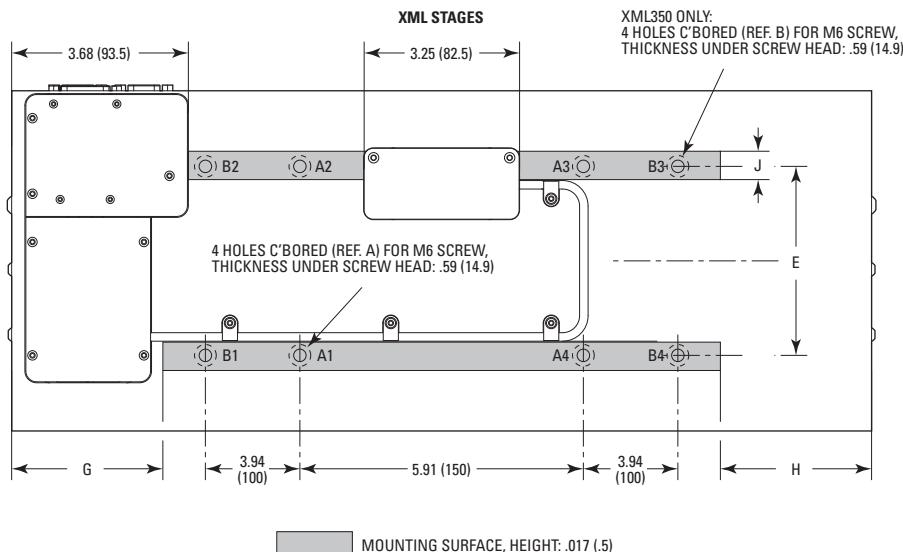
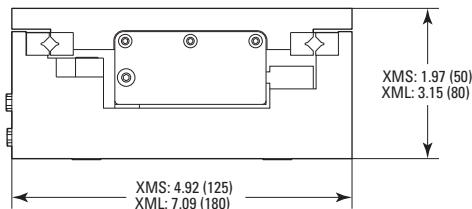


DIMENSIONS IN INCHES (AND MILLIMETERS)

	A	B	C	D	E
XMS50	4.92 (125)	—	—	—	2.95 (75)
XMS100	7.28 (185)	6.10 (155)	1.77 (45)	5.31 (135)	2.95 (75)
XMS160	9.84 (250)	7.28 (185)	1.77 (45)	7.87 (200)	2.95 (75)
XML210	13.98 (355)	9.84 (250)	3.94 (100)	5.31 (135)	3.94 (100)
XML350	21.85 (555)	9.84 (250)	3.94 (100)	13.19 (335)	3.94 (100)

	F	G	H	J	K
XMS50	.28 (7)	—	—	.39 (10)	.28 (7)
XMS100	.28 (7)	—	—	.39 (10)	.59 (15)
XMS160	.28 (7)	—	—	.39 (10)	.59 (15)
XML210	.47 (12)	2.91 (74)	2.66 (67.5)	.59 (15)	—
XML350	.47 (12)	3.15 (80)	3.15 (80)	.59 (15)	—

XMS & XML STAGE CONNECTORS:  
SUB-D9M FOR MOTOR  
SUB-D9F FOR END-OF-RUNS & THERMISTANCE  
SUB-D15M FOR ENCODER



### CAUTION

Mounting screws of XM stage magnetic channels are accessible via the external side of the top plate. They mustn't be unscrewed; this may damage stage specifications.

**8.0    Accessories****8.1    Granite Base for Ultra Surface Flatness**

The flatness of the surface is a major factor in the positioning accuracy and repeatability of a motion system. Polished granite plates are among the flattest, commercially available surfaces. Granite's tight flatness tolerance and extreme hardness make it logical option to complement Newport's Ultra-Precision Linear Motor XM series stage.

The GB series granite base plates (to order separately) feature 3 point mounting, to make-up for non-flat tables. Edge handles facilitate handling and locating the base plate on the work surface.



Model	Description
<b>GB50</b>	Granite Base for XMS50
<b>GB100</b>	Granite Base for XMS100
<b>GB160</b>	Granite Base for XMS160
<b>GB210</b>	Granite Base for XML210
<b>GB350</b>	Granite Base for XML350

## 9.0 Maintenance

### RECOMMENDATION

**It is recommended to contact our After Sales Service which will know to define the appropriate maintenance for your application.**

#### 9.1 Maintenance

The XM stage requires no particular maintenance. Nevertheless, this is a precision mechanical device that must be kept and operated with caution.

### PRECAUTIONS

**The XM stage must be used or stocked in a clean environment, without dust, humidity, solvents or other substances.**

### RECOMMENDATION

**It is recommended to return your XM stage to Newport's After Sales Service after every 2000 hours of use for lubrication.**

**If your stage is mounted on a workstation and cannot be easily removed, please contact Newport's After Sales Service for further instructions.**

#### 9.2 Repair

### CAUTION



**Never attempt to disassemble a component of the stage that has not been covered in this manual.**

**To disassemble a non specified component can cause a malfunction of the stage.**

If you observe a malfunction in your stage, please contact us immediately to arrange for a repair.



### CAUTION

**Any attempt to disassemble or repair a stage without prior authorization will void your warranty.**

#### 9.3 Calibration



### CAUTION

**It is recommended to return your XM stage to Newport once a year for recalibration to its original specifications.**

# Service Form

## Your Local Representative

Tel.: \_\_\_\_\_

Fax: \_\_\_\_\_

Name: \_\_\_\_\_

Return authorization #: \_\_\_\_\_

(Please obtain prior to return of item)

Company: \_\_\_\_\_

Date:

Country:

Phone Number:

P.O. No. 1

T.O. Number: \_\_\_\_\_

Tax Number: \_\_\_\_\_

**Item(s) Being Returned:**

Model #: \_\_\_\_\_

Serial #: \_\_\_\_\_

Description: \_\_\_\_\_

---

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Reasons of return of goods (please list any specific problems): \_\_\_\_\_



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